

**PAINT AND SPRAY SYSTEMS  
SPECIALTY CORRECTION LIST  
2006 IBC, 2006 IFC, and 2003 NFPA 33  
To Accompany Architectural Review**

Listed items require revision/clarification by contractual documentation (i.e., revised drawings, specifications, addenda, etc.) before plans can be approved. *Answers in letter form are not acceptable.* The Design Intent must be submitted by a Tennessee registered designer. **Starting construction before plan approval may be considered as just cause, by the State, to issue a stop work order.** [Rule 0780-2-3-.02]

### **Submittal Requirements**

1. Provide two sets of fire protection design drawings submitted and sealed by a Tennessee registered designer for the spray application operation and processes including the mixing room, spray area, spray room and/or booth, location and continuity limits of any fire-resistance rated separation walls, mechanical ventilation and makeup air systems, filter systems, exhaust duct systems, automatic fire protection sprinkler system, storage mixing and handling of flammable and combustible liquids, and drying, curing, or fusing apparatus.

### **Spray Application**

1. Spray application must be contained by spray booth, spray room and/or spray area. [IBC 416, IFC 1504.3.2, and NFPA 33 4.1]
2. The paint booth must be listed by a nationally recognized testing laboratory (U.L., ETL, etc.) or engineered by a Tennessee registered professional engineer competent in the area of storage, handling, and the spray application of flammable and combustible materials, and related safety systems. Provide the following information: model number, booth length and width, minimum exhaust CFM, maximum supply CFM, and any application restrictions.
3. Identify the locations of the mixing room, spray area, and spray room.
4. Identify what drying action will be used, such as ambient or heated air. [NFPA 33 13.1]
5. Identify type and quantity of chemicals for each room to determine classification of hazard of contents. [IBC 307.1.1]
6. Spray application operation and processes must not be conducted in any building that is classified as an assembly, educational, institutional, or residential occupancy unless they are located in a room that is separated by 2-hour fire-resistance rated assemblies both horizontally and vertically and is protected by an automatic fire protection sprinkler system [NFPA 33 4.2]

## **Paint Area/Mixing Room Construction**

1. Walls and ceilings that intersect or enclose a spray area must be constructed of noncombustible or limited-combustible materials and assemblies and must be securely and rigidly mounted or fastened. [NFPA 33 5.1]
2. The interior surface of the spray area, room, or booth must be smooth without pockets that could trap residues and designed to facilitate ventilation and cleaning. [NFPA 33 5.1]
3. The floor of the spray room, area or booth must be constructed of non-combustible, limited-combustible material, or combustible material that is completely covered by non-combustible material. [NFPA 33 5.1]
4. For spray areas and non-listed booths, air intake filters that are part of a wall or ceiling assembly must be listed Class 1 or Class 2 in accordance with UL 900, Test Performance of Air Filters. [NFPA 33 5.1]
5. Vision panels for spray areas and non-listed booths must be made from heat treated, wire-glass, or hammer wire-glass and must be sealed to confine vapors and residues to the spray area. Panels for externally mounted light fixtures must be separated from the fixtures such that the surface temperature of the glass does not exceed 200°F. [NFPA 33 5.5]
6. Aluminum must not be used for structural support members or the walls or ceiling of a spray booth. [NFPA 33 5.1.3]
7. Aluminum must not be used for any part of the ventilation ductwork associated with the spray booth or spray room. [NFPA 33 5.1.3]
8. When walls or ceiling assemblies are constructed of sheet metal, single-skin assemblies must be no thinner than 0.0478 in. and each sheet of double-skin assemblies must be no thinner than 0.0359 in. [NFPA 33 5.1.4]
9. Spray rooms must be constructed of and separated from surrounding buildings by construction assemblies that have a fire-resistance rating of one hour. [NFPA 33 5.1.6]
10. Spray booths must be separated from other operations by a minimum distance of 3 feet or by a partition, wall or floor/ceiling assembly having a minimum fire resistance rating of 1 hour. Multiple spray booths connected together shall be considered as a single operation. [NFPA 33 5.3]
11. Whether listed or not, spray booths must be installed so that all parts of the spray booth are readily accessible for cleaning. [NFPA 33 5.3.1]
12. Clear space about the spray booth must not be less than 3 feet in all directions unless exceptions are met. [NFPA 33 5.3.2]

## **Mechanical**

1. Provide details on the plans for any exhaust fan showing the model number, special features such as non-ferrous blades, TEFC motor, explosion proof, electrical data, and mounting details. [NFPA 33 7.10.1]
2. Mechanical ventilation must be kept in operation during all hours of spray systems operation. The spray system must be interlocked to the spray application equipment if the operation is not constantly monitored by an attendant. [NFPA 33 7.2.3]
3. Makeup air must be provided to balance the exhausted air and located such there is no recirculation of contaminated air (see Exception). [NFPA 33 7.3 and NFPA 33 7.5.1] Provide balancing schedule, Table of calculated friction losses for supply and exhaust at the expected design point (include booth and/or filter losses), manufacturer, and model number.
4. Overspray collection filters must have visible gauges, audible alarms, or an effective inspection program. [NFPA 33 7.2.1]
5. Exhaust ducts from spray operations must be routed to the outside in the most direct manner available and extend to at least 6 feet above any exterior wall or roof. [NFPA 33 7.4]
6. Exhaust ducts from spray operations must not penetrate a structurally independent *fire wall*. [NFPA 33 7.4]
7. Exhaust ducts from spray operations must not discharge towards any combustile construction within 25 feet of the duct's outlet nor discharge toward any unprotected opening in any noncombustible or limited-combustible construction that is within 25 feet of the exhaust discharge point. [NFPA 33 7.4]
8. Exhaust ducts from spray operations must not be manifolded together unless exceptions are met. [NFPA 33 7.6]
9. Exhaust ducts, materials and fasteners must be of steel unless steel is specifically incompatible with the spray operation. [NFPA 33 7.7]
10. Exhaust ducts must be designed to support the weight of the duct itself and any anticipated residual material buildup inside. Exhaust ducts must also support the anticipated weight of any accumulated sprinkler discharge when sprinkler protection is provided inside of the ducts. [NFPA 33 7.8.1]
11. Exhaust ducts must be complete themselves and not use other building components such as walls and ceilings to complete the duct enclosure. [NFPA 33 7.8.4]
12. Exhaust ducts from spray operations are permitted to be round, rectangular or any other suitable shape and must be provided with doors, panels, and other means to facilitate inspection cleaning and maintenance and to access fire protection devices. [NFPA 33 7.9]
13. Air-makeup and spray area exhaust must not be interlocked with the fire alarm system and must remain functional during any fire alarm condition unless one of the two specific exceptions apply. [NFPA 33 9.3]

14. The exhaust fan and drive used in spray operations must:
  - A. Have a nonferrous fan blade or impeller or mechanically designed such that two separate ferrous components cannot strike one another. [33 7.10.1]
  - B. The fan or blower assembly must be designed with enough internal clearances to prevent contact between moving parts or fire by friction due to thermal expansion or vibration. [33 7.10.1]
  - C. The fan blade shaft must be strong enough to maintain alignment even when the blades are heavily overloaded. [33 7.10.1]
  - D. All bearings are to be self-lubricating or can be lubricated from outside of the duct and/or booth. [33 7.10.1]

## **Fire Suppression**

1. Spray areas/rooms/booth which include associated plenums and ductwork, as well as particulate filters, solvent concentrator units, recirculation units, and mixing room must be protected by an automatic fire suppression system. [NFPA 33 9.1]
2. The automatic sprinkler system must be a wet pipe system, a dry pipe system, a preaction system, or an open head deluge whichever is more appropriate for the operation to be protected, subject to the authority having jurisdiction. [NFPA 33 9.4.1]
3. Fire suppression system must meet one of the following:
  - A. Automatic sprinkler systems must meet NFPA 13 which is designed for Extra Hazard Group 2 classification and must be installed by a Tennessee licensed sprinkler contractor. [NFPA 33 9.1.1(1), 33 9.4.2, and Rule 0780-2-7]
  - B. A NFPA 16 automatic foam water sprinkler system. [NFPA 33 9.1.1(2)]
  - C. A NFPA 12 carbon dioxide extinguishing system. [NFPA 33 9.1.1(3)]
  - D. A NFPA 17 dry chemical extinguishing system. [NFPA 33 9.1.1(4)]
  - E. A NFPA 2001 gaseous agent extinguishing system. [NFPA 33 9.1.1(5)]
4. For continuous spray application operations, one or more manual emergency system shutdown stations must be installed to serve each spray area. When activated, the stations must accomplish at least the functions listed in NFPA 33 9.2.1. At least one such station must be within ready access of operating personnel. When access to this station is likely to involve exposure to danger, an additional station must be located adjacent to an exit from the area. [NFPA 33 9.2.2]
5. Supply details of how the fire suppression piping is installed and maintains effective sealing/isolation of high/low pressure zones (i.e. the booth or spray area). Also these details must be effective in how they establish other elements of design such as the build up of flammable or combustible dusts, overspray, etc. Piping may be run inside or outside of the containment zone. [NFPA 33 3.3.10, NFPA 33 9.4.7, and NFPA 33 10.2]
6. The sprinklers for each spray area and mixing rooms must be controlled by a separate, accessible, listed indicating valve. The sprinkler system in the stacks and ducts must be automatic and not subject to freezing. [NFPA 33 9.4.5 and 9.4.6]

7. Sprinklers protecting spray areas and mixing rooms must be protected against overspray residue so that they will operate quickly in event of fire. [NFPA 33 9.4.7] Sprinklers must be permitted to be covered by cellophane bags having a thickness of 0.003 in. or less or by thin paper bags. These coverings must be replaced frequently so that heavy deposits of residue do not accumulate. Provide details on the access panels or other means within plans that permit easy maintenance of the bags. [NFPA 33 9.4.7.1]
8. Clean agent, CO<sub>2</sub>, and dry chemical systems must be capable of discharging its contents into the entire protected area simultaneously including the exhaust plenum and exhaust ductwork. Provide flow calculations for all nozzles. Any field installation of any fixed fire suppression system must be performed by a Tennessee licensed fixed fire suppression system contractor. [NFPA 33 9.5 and 0780-2-14]
9. Automated powder application equipment, both listed and unlisted, must be further protected by listed optical flame detection installed and supervised in accordance with 2002 NFPA 72. The optical flame detection must, in event of ignition, react to the presence of flame within one-half second and must accomplish all of the following:
  - A. Stop any conveyors into and out of the spray area. [NFPA 33 9.7.1(1)]
  - B. Shut off ventilation. [NFPA 33 9.7.1(2)]
  - C. Shut off application, transfer, and powder collection equipment. [NFPA 33 9.7.1(3)]
  - D. Close segregation dampers in associated ductwork to interrupt airflows from application equipment to powder collectors. [NFPA 33 9.7.1(4)]
  - E. Disconnect power to the high voltage elements in the spray area and de-energize the system. [NFPA 33 9.7.1(5)]
10. Automated liquid electrostatic spray application equipment, both listed and unlisted, must be further protected by listed optical flame detection installed and supervised in accordance with 2002 NFPA 72. The optical flame detection must, in event of ignition, react to the presence of flame within one-half second and must accomplish all of the following:
  - A. Meet all of the requirements of NFPA 33 9.2.1. [NFPA 33 9.8.1]
  - B. Disconnect power to the high voltage elements in the spray area and de-energize the system. [NFPA 33 9.8.1]

## **Electrical**

1. Electrical wiring and utilization equipment must meet all of the applicable requirements of Articles 500 Hazardous (Classified) Locations, Classes I, II, and III, Divisions 1 and 2; 501 Class I Locations; 502 Class II Locations; and 516 Spray Application, Dipping and Coating Processes of 2005 NFPA 70 National Electric Code, and NFPA 33 Spray Application Using Flammable or Combustible Materials, Chapter 4 unless the exceptions are met. [NFPA 33 6.2.1]

2. For the purposes of NFPA 33, the Zone system of electrical area classification must be applied as follows:
  - A. The inside of open or closed containers or vessels must be considered a Class I, Zone 0 location. [NFPA 33 6.2.2(1)]
  - B. A Class I, Division 1 location must be permitted to be alternatively classified as a Class I, Zone 1 location. [NFPA 33 6.2.2(2)]
  - C. A Class I, Division 2 location must be permitted to be alternatively classified as a Class I, Zone 2 location. [NFPA 33 6.2.2(3)]
3. Where areas in the same facility are classified separately, a Class I, Zone 2 location must be permitted to abut, but must not overlap, a Class I, Division 2 location. A Class I, Zone 0 or Class I, Zone 1 location must not abut a Class I, Division 1 or a Class I, Division 2 location. [NFPA 33 6.2.4 and 2005 NFPA 70 505.7(B)]
4. Devices or equipment such as unit heaters, fans, open motors or processes which can produce open flames or sparks, and equipment whose exposed surfaces exceed the autoignition temperature of the material being sprayed cannot be located in a spray area or in any surrounding area that is classified as Division 2 or Zone 2 with the exception of drying, curing, or fusing apparatus covered by NFPA 33 13. [NFPA 33 6.2.5]
5. Any equipment or apparatus that is capable of producing sparks or particles of hot metal such as open electrical motors and arc welders and is located above or adjacent to either the spray area or the surrounding Division 2 or Zone 2 areas must be of the totally enclosed type or must be constructed to prevent the escape of sparks or particles of hot metal. [NFPA 33 6.2.6]
6. Electrical wiring and utilization equipment that is located in the spray area and *is not* subject to deposits of combustible residues are suitable for Class I, Division 1; Class I, Zone 1; or Class II, Division 1 locations, whichever is applicable. [NFPA 33 6.4.1]
7. Electrical wiring and utilization equipment that is located in the spray area and *is* subject to deposits of combustible residues must be listed for such exposure and must be suitable for Class I, Division 1; Class I, Zone 1; or Class II, Division 1 locations, whichever is applicable. [NFPA 33 6.4.2]
8. Light fixtures that are attached to the walls or ceilings of a spray area that are separated from the spray area by glass panels that meet the requirements of NFPA 33 5.5 and are located within a Class I, Division 2, Class I, Zone 2, or Class II, Division 2 location must be suitable for such location. [NFPA 33 6.6.2]
9. Light fixtures that are attached to the walls or ceilings of a spray area; are separated from the spray area by glass panels that meet the requirements of NFPA 33 5.5. Such fixtures must be serviced from outside the spray area. [NFPA 33 6.6.2]
10. Light fixtures that are an integral part of the walls or ceiling of a spray area are permitted to be separated from the spray area by glass panels that are an integral part of the fixture. Such fixtures must be listed for use in Class I, Division 2; Class I, Zone 2; or Class II, Division 2 locations, whichever is applicable, and must be listed for accumulations of deposits of combustible residues. [NFPA 33 6.6.3]
11. Light fixtures that are an integral part of the walls or ceiling of a spray area are permitted to be separated from the spray area by glass panels that are an integral part of the fixture. Such fixtures must be permitted to be serviced from inside the spray area. [NFPA 33 6.6.3]

12. Electrical wiring and utilization equipment located outside, but within 20 ft horizontally and 10 ft vertically of a nonenclosed spray area and not separated from the spray area by partitions extending to the boundaries of the area are suitable for Class I, Division 2; Class I, Zone 2; or Class II, Division 2 locations, whichever is applicable. [NFPA 33 6.5.1]
13. Any electrical wiring or equipment within 3 feet in any direction outside of the booth around any openings for closed-top, open-front, or open-face spray booths must be suitable for Class I, Division 2 locations or Class II Division 2 whichever is applicable. [NFPA 33 6.5.2] Additional requirements exist **for one** of the following:
  - A. If the exhaust ventilation system is interlocked with the spray application equipment, then the Division 2 or Zone 2 location must extend 5 ft horizontally and 3 ft vertically from the open-face or open-front of the booth or room. [NFPA 33 6.5.2(1)]
  - B. If the exhaust ventilation system is not interlocked with the spray application equipment, then the Division 2 or Zone 2 location must extend 10 ft and 3 ft vertically from the open-face or open-front of the booth or room. [NFPA 33 6.5.2(2)]
14. All applicable parts which are in or convey flammable or combustible liquids or aerated combustible solids must be bonded to ground to prevent static buildup. [NFPA 33 6.7]

### **Storage, Handling, and Distribution of Flammable and Combustible Liquids**

1. Storage mixing and handling of flammable and combustible liquids must meet the applicable requirements of 2003 NFPA 30 Flammable and Combustible Liquids Code. [NFPA 33 8.1]
2. There must be not more than three approved flammable liquid storage cabinets in any single process area without the approval of the authority having jurisdiction. [NFPA 33 8.2.1]
3. Storage cabinets must be listed or shall be designed and constructed to meet the requirements of 2003 NFPA 30. [NFPA 33 8.2.1]
4. Any single cabinet must contain not more than 120 gal of Class I, Class II, or Class IIIA liquids of which no more than 60 gal be Class I and Class II liquids. [NFPA 33 8.2.1]
5. The amount of liquid permitted in a single spray area must not exceed 60 gal. [NFPA 33 8.3.3]
6. At least one mixing room must be provided that is either adjacent to or directly connected to each spray area or booth. Dispensing or transfer of liquids from containers, mixing of liquids, and filling of containers, including portable mixing tanks and “pressure pots,” must be done only in a mixing room or in a spray area. [NFPA 33 8.3.1 and Office Policy]

7. All mixing rooms must meet all of the following. [NFPA 33 8.3.2]
  - A. The mixing room must meet the construction requirements of NFPA 33 5.1.
  - B. The total area of the mixing room cannot exceed 150 sf.
  - C. The mixing room must be designed to contain a spill.
  - D. The mixing room or a spray area used for mixing and dispensing operations must be provided with continuous mechanical ventilation capable of providing not less than 1 ft<sup>3</sup>/min of air movement per ft<sup>2</sup> of floor area or 150 ft<sup>3</sup>/min, whichever is greater. The ventilation system must be in operation at all times.
  - E. Dispensing and mixing rooms must be classified, for purposes of electrical area classification, the same as enclosed spray booths, in accordance with NFPA 33 6.5.4.
  - F. The mixing room must be provided with an approved automatic fire protection system that meets all applicable requirements of NFPA 33 Chapter 9.
  - G. The mixing room must be provided with portable fire extinguishers located in accordance with 2002 NFPA 10.
8. Where a separate mixing room is provided and the mixing room is located adjacent to or within 6 ft of an adjacent spray area/areas the combined quantities of liquids located in the spray areas and the mixing room cannot be more than 120 gal. [NFPA 33 8.3.4]
9. Where a separate mixing room is provided and the mixing room is located 6 ft or more from an adjacent spray area or areas, the quantity of liquid permitted in the mixing room shall not exceed 2 gal/ft<sup>2</sup>, up to a maximum of 300 gal. [NFPA 33 8.3.5]
10. Piping for flammable or combustible liquids that carry material between tanks and mixing rooms must be steel or other materials mechanically and thermally capable of withstanding heat and physical damage. Piping must also be bonded to ground. [NFPA 33 8.4.1]
11. Piping for spray areas must be steel or other materials mechanically and thermally capable of withstanding heat and physical damage. Where tubing or hoses are used, a mechanical shut-off valve must be provided. [NFPA 33 8.4.2]
12. Where pumps are provided, all hoses, piping, fittings must be rated for the maximum discharge of the pump. [NFPA 33 8.4.4]
13. Where pumps are provided, automatic shut-offs must be provided in the event of fire. When the tanks are greater than 5 gallons, automatic shut-offs must be provided at the tank outlet in the event of fire. [NFPA 33 8.4.5]
14. Pressurized containers used to supply spray nozzles, air storage tanks, and coolers shall meet the requirements of ASME *Boiler and Pressure Code*, Section VIII for construction, maintenance, and tests unless all exceptions are met. [NFPA 33 8.5.5]

## **Drying, Curing or Fusion Processes**

1. Drying, curing, or fusing apparatus used in connection with spray application of flammable and combustible materials shall meet all applicable requirements of 2003 NFPA 86. [NFPA 33 13.1.1]

2. Spray booths, spray rooms, or other enclosures used for spray application of flammable and combustible materials must not be used for drying, curing, or fusing operations with the exception of those permitted by NFPA 33 13.2 (air dry) and NFPA 33 13.3 (specially designed heated). [NFPA 33 13.1.2]
3. If a spray booth, spray room, or other enclosure is also used for air-drying, curing, or fusing operations and the air temperature therein is not elevated above ambient conditions, the ventilation system must maintain the concentration of any vapors in the exhaust stream below 25 percent of the lower flammable limit. Provide calculations for the worst case material sprayed in the booth. [NFPA 33 13.2]
4. Spray booths, spray rooms, or other enclosures used for spray application operations are permitted to be adjacent to or connected to rooms or equipment used for drying, curing, or fusing. Interconnecting doors and related interlocks must meet the requirements of 2003 NFPA 86. [NFPA 33 13.3.2 and office policy]
5. Interconnecting doors' interlocks must be provided to prevent spray application operations when the doors are open. A high temperature limit switch must be provided to automatically shut off the drying apparatus if the air temperature in the spray area exceeds 200°F. Provide documentation on plans. [NFPA 33 13.3.2]
6. A high temperature limit switch must be provided to automatically shut off the drying booth if the air temperature in the spray area exceeds 200°F. [NFPA 33 13.3.1.2]
7. Spraying apparatus, drying apparatus, and the ventilating system must be equipped with interlocks arranged so that the spraying apparatus cannot be operated when drying apparatus is in operation or is energized. Provide clear details exactly how the spraying system is functionally locked out of operation. [NFPA 33 13.3.1.3]
8. Radiant drying apparatus that is permanently attached to the walls, ceiling, or partitions of the spray area must be listed for exposure to flammable or combustible vapors, mists, dusts, residues, or deposits. [NFPA 33 13.3.1.4]
9. Drying, curing, or fusing apparatus must be affixed with a permanently attached, prominently located warning sign indicating that ventilation must be maintained during the drying, curing, or fusing period and that spraying must not be conducted in the vicinity in such manner as to deposit residue on the apparatus. [NFPA 33 13.6]